Pollution Prevention and Waste Minimization Green Zia Analysis of the Central Health Physics Calibration Facility Project

1.0 Background

The Central Health Physics Calibration Facility is a line item construction project to upgrade and consolidate existing health physics calibration functions in one location. The upgrades will allow calibration of radiation protection instruments to required levels, which are higher than feasible in currently existing facilities.

The construction, to be completed in October 2001 will upgrade and modify the appropriate existing facilities at TA-36. The project is currently in Title II, final design. The project consists of the design and construction of a new building to house the calibration activities. The building will be sited at TA-36, west of existing Building 36-1. The building will be single story, high bay, and will be approximately 4500 square feet in area. The building will have reinforced concrete walls 6" to 2' thick, a concrete roof, and internal concrete walls. The building will include two free-in-air experimental areas, a high level and a low level gamma room, an X-ray room, bathrooms, and control station areas. The project will allow the Laboratory to meet the requirements of the DOE/EH 0256T, Revision 1, “Radiological Control Manual” and 10CFR 835 “Occupational Radiation Protection”.

2.0 Scope

This document addresses only the pollution prevention and waste minimization opportunities. The analysis will cover the three activities that constitute the upgrade: demolition and site preparation, construction and operation of the completed facilities. Life cycle energy and resource conservation will be addressed in the facility operation analysis.

The analysis will use certain of the Green Zia tools.

3.0 Application of “Green Zia” Tools

3.1 Tools

The State of New Mexico Environment Department (NMED) uses the Green Zia tools in their Green Zia pollution prevention program. The tools allow a process-based system analysis to be performed for virtually any operation. This structured system facilitates process analysis, problem solving and decision making. The tools provide a framework to allow users to evaluate pollution prevention opportunities on a continuing basis. In this analysis we will apply the process mapping and prioritization tools.

3.2 Process Diagrams

New facility construction and operation at the Laboratory offers a number of opportunities for pollution prevention and waste minimization. The activities associated with the construction phase can generally be divided into site preparation activities and actual construction, renovation and upgrade activities. For the Central Health Physics Calibration Facility we will consider these activities as well as initial building operation. The activities can be described in the following three process maps.

3.2.1 Demolition and Site Preparation

The process map for site preparation is shown in Figure 1.

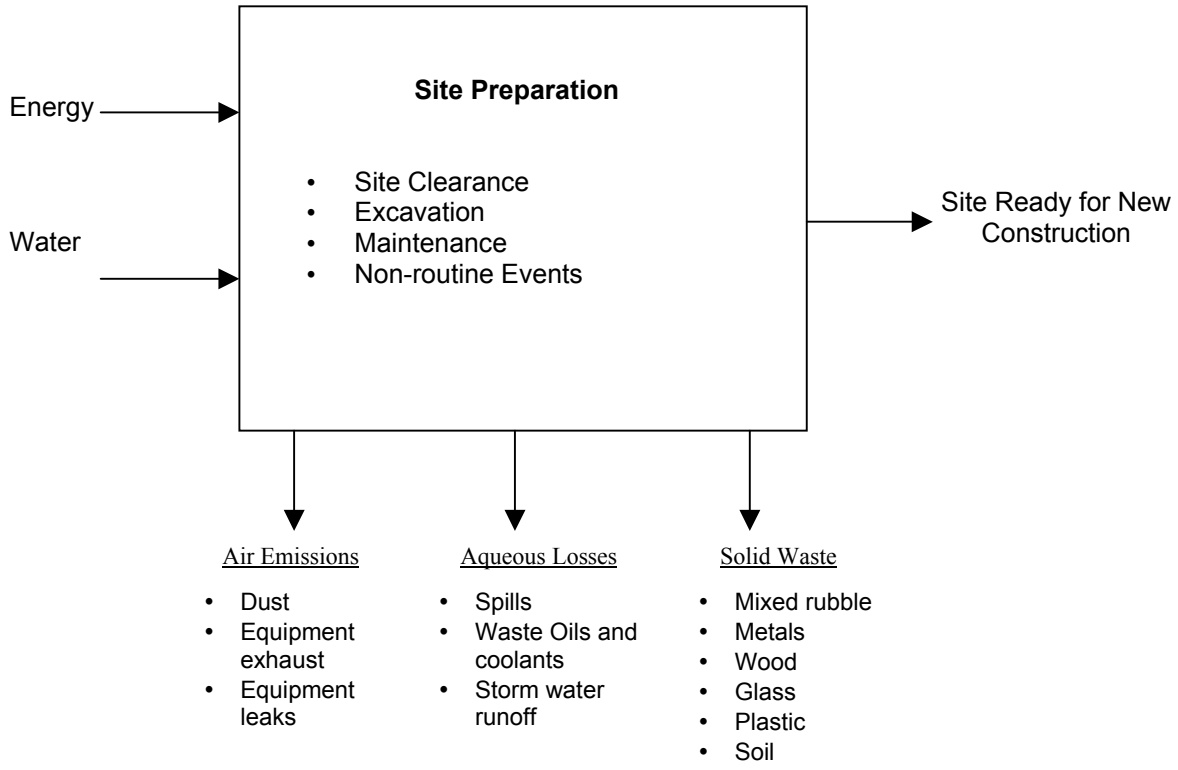

Figure 1. Demolition and Site Preparation Process Map

Both energy and water are utilized during the site preparation activities. For the Central Health Physics Calibration Facility Project the dominant site preparation activities will be demolition and site clearing. A small open shed must be demolished as part of site preparation. Waste streams produced by these activities include air emissions of excessive dust and equipment exhaust and leaks, aqueous losses of waste oils and coolants from the equipment, spills and storm water runoff, and solid waste consisting of metals, mixed rubble, wood, glass, plastics and soil. Aqueous losses associated with spills and losses of oil and coolant are non-routine and can generally be controlled through training and

procedures. A significant quantity of brush and small tree waste will be generated in this operation.

3.2.2 Facility Construction/ Modification

After site preparation activities are completed, construction of the new facility can begin. Figure 2 shows the anticipated waste streams for construction of a new facility.

Inputs to the system include water, energy and building materials. Depending on the type of facility the quantities and types of inputs can vary.

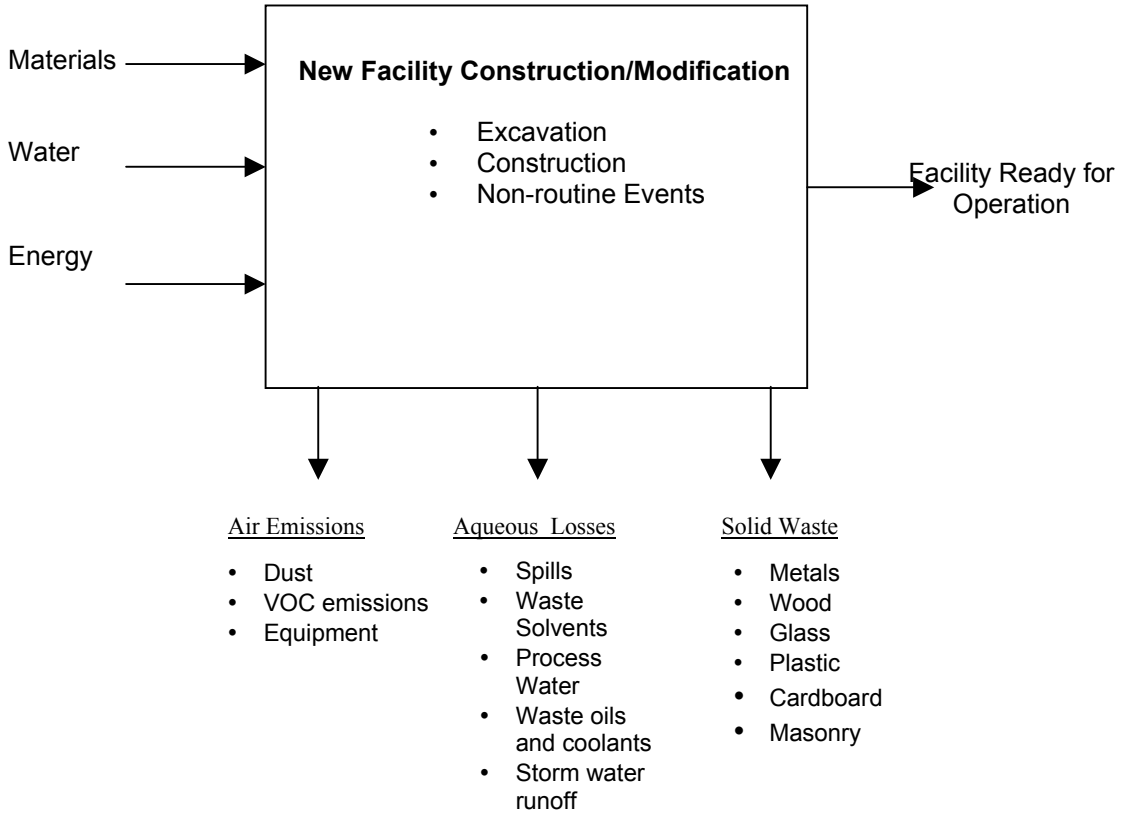

Figure 2. Facility Construction/modification Process

Many of the wastes produced are similar to the site preparation wastes with some variations. Air emissions will not only include fugitive dust emissions and equipment exhaust and leaks, but also the possibility of volatile organic compound (VOC) emissions from painting operations. Aqueous losses will consist primarily of water used to mix concrete, pressure test piping, waste cleaning solvents, and cleanup waste from masonry tools. Solid wastes

generated will include many of the same wastes as the site preparation phase including metals, wood, glass, and plastic from scrap building materials and construction debris. . Cardboard waste and excess masonry materials will also be generated during the construction/modification process.
Solid wastes will also include paint wastes and some excavation soils.

After the construction of the facility has been completed project management will turn the facility over to the operating group.

3.2.3 New Facility Operation

Activities included in the operation of the facility include facility maintenance and repair, utilities, and janitorial support. Figure 3 shows the anticipated waste streams for the operation of a facility. All facilities will consume both water and energy. Depending on the facility the amount and types of materials consumed will vary.

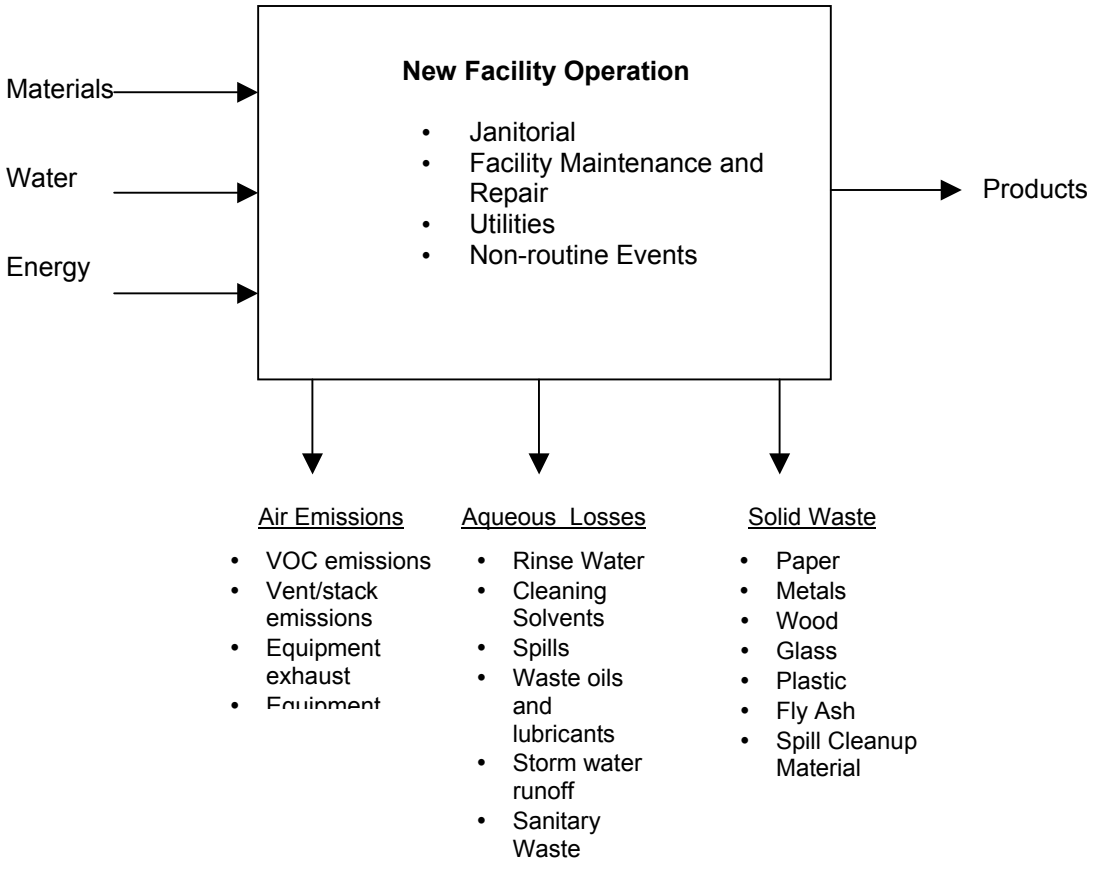

Figure 3. New Facility Operation

The quantities of energy, water and resources used in the operation of the building will depend on the extent to which pollution prevention and waste minimization is integrated into the building design. Buildings can be designed to consume very few resources and thus have low environmental impact as well as lower lifecycle costs for operation. Several features have been incorporated into the design of the Central Health Physics Calibration Facility.

3.3 Waste Stream Prioritization

In order to prioritize the waste streams, they are first characterized by size and type. Some small waste streams could be higher priority because of the type of waste produced. However, that is not the case here. Only small quantities of waste other than solid sanitary waste will be generated and most of that will be associated with painting and cleaning solvents.

At this point in the Central Health Physics Calibration Facility construction process, the waste streams that can be confidently estimated are the streams generated by demolition, site preparation and new facility construction.

3.3.1 Demolition and Site Preparation

Most of the waste is generated by the demolition of the small metal shed and by site clearing. The types and volumes of waste from the demolition and site preparation activities are presented in the following table

Material	Volume ($yd.^3$)	Significance[1]
Brush and small trees	37	Significant
Sheet metal and wire mesh	825 ft^2	Significant
10” by 6” steel beams plus bracing	8 each	Significant
Rubble concrete waste	3.9	Insignificant
Misc. Construction Waste	TBD	Insignificant

Significant = quantities large enough or potentially large enough to require regulatory oversight

Table 1. Waste Generated during Site Preparation

In site preparation, as in other construction activities, there may be unplanned events that lead to waste or pollution, such as, spills, dust generation or stormwater contamination. Planning, training and implementing proper procedures can minimize these non-routine events.

3.3.2 New Facility Construction

Waste generated from new facility construction consists primarily of earth excavated for foundations and for the below grade pits for the calibration equipment. There will be six pits excavated at the site of the new building. Each pit will be 12" in diameter and 16' deep. Other waste and pollution includes wood used for concrete forms, dust, paint, adhesive and cleaning solvents and scrap packing materials. The estimated quantities of waste generated during construction are shown in the following table.

Material	Volume ($yd.^3$)	Significance[1]
Excavated earth	1811	Significant
Wood for concrete forms	144	Significant
Dust, VOCs,and other air emissions	TBD	Insignificant
Misc. Construction Waste	TBD	Insignificant

Significant = quantities large enough or potentially large enough to require regulatory oversight

Table 2. Waste Generated during New Facility Construction

4.0 Pollution Prevention and Waste Minimization Opportunities

The preferred actions to minimize waste during the site preparation and construction phase of Central Health Physics Calibration Facility Project are shown in Table 3.

Material	Minimization Action
Brush, wood & lumber	To the extent possible, all wood products will be transported to the landfill and chipped for reuse as mulch.
Excavated soil	Will be stockpiled and used to refill excavations. Excess will be used as clean fill for other projects on LANL property.
Steel, sheet metal and other metal waste	All metal waste will be salvaged, sold-in-place or recycled.
Rubble concrete waste	Concrete waste will be crushed and reused.
Misc. Construction Waste	Will be reused or recycled to the extent possible. Normal and acceptable best practices will be employed.

Table 3. Waste Minimization Actions for Site Preparation and Construction

All soils excavated during site preparation and construction will be replaced in the same area or stockpiled for use at other project sites. Recycling of soil will be done in accordance with applicable NEPA requirements.

The following guidelines will be used during construction activities. When the construction contracts are placed, a detailed assessment of projected waste quantities will be performed and contractors will evaluate and propose mitigation actions (see 5.0 Implementation Plan). The general guidelines include:

- Mitigation control for soil erosion and sedimentation
- A Stormwater Pollution Prevention Plan, including inspection and maintenance of stormwater controls, stormwater management following construction and soil stabilization with vegetation.
- Recycle and reuse of shipping boxes, metals, wire ends, etc.
- Spill controls and training
- Dust suppression

The exact measures along with metrics and quantitative goals will be developed in conjunction with the contractor when the contractor is selected. The measures, metrics and goals will be published in a P2 and Waste Minimization Implementation plan before inception of construction.

The building is being designed with several features that will minimize pollution, waste and resource consumption during operation. These design features include:

- Site development for stormwater runoff and drainage
- Decentralized natural gas heating to lower electrical consumption
- “Green” fluorescent lighting with electronic ballasts
- Minimal glazing to lower solar gain
- The planned concrete structures have thick concrete walls that will provide the thermal mass necessary to control temperature variation
- Low flow plumbing fixtures

5.0 Implementation Plan

Several steps will be taken that will lead to a detailed Pollution Prevention and Waste Minimization Implementation Plan. These steps are detailed below.

5.1 Contract Language

The request for proposals and contract specifications for the A/E design contractor will require respondents to provide waste generation estimates and a Waste Minimization/Pollution Prevention Plan as part of the bid package. Los Alamos will conduct a review of this report to determine whether the proposed Pollution Prevention and Waste Minimization Plan provides adequate assurance that elimination/minimization of hazardous and pollutant materials and other waste has been properly planned for in all phases of the life cycle.

5.2 Analyze Design Options

A Waste Stream and Resource Consumption analysis will be performed to identify waste streams and resource impacts. The waste streams identified should be eliminated or minimized and energy conservation, water conservation natural resource conservation, ecological protection and regulatory constraints must be considered.

P2 options to accomplish the waste minimization will be defined and investigated.

5.3 Title II Pollution Prevention and Waste Minimization Actions

Therefore the following activities must be completed during Title II.

- Anticipated waste streams identified and quantified
- Goals, metrics and performance measures developed
- Develop design criteria that include: energy conservation, materials conservation, solid waste reduction and water conservation
- Develop P2/Waste Minimization priorities
- Develop P2/Waste Minimization integration strategy
- Incorporate P2/Waste Minimization into project schedule
- Conduct design analysis

- Identify and select best P2/Waste Minimization options.

References:

Los Alamos National Laboratory Environmental Stewardship Roadmap, LA-UR-00-282, January 7, 2000.

Acknowledgements

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